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Prospective Study on Rate of Complication of Different Anatomical Location of Mesh Repair in Hernia

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KEYWORDS

Onlay mesh location, Inlay mesh location, Underlay mesh location, Sublay mesh location, Retromuscular Sublay mesh, Intraperitoneal Sublay mesh, Preperitoneal Sublay mesh

ABSTRACT:

Background: Hernia repair is carried out on many people every year. Most of these surgeries involve mesh implants which when results in serious complications, the need to identify the factors affecting the complications arises. The anatomical location of mesh is found to be one of the factors that can reduce the occurrence of major complications i.e. hernia recurrence. The location of the mesh affects the incorporation of mesh with the tissues, the tensile strength of the abdominal wall and the repair and immune reaction between the tissue and the mesh. The aimed to compare various anatomic locations of mesh and their impact on mesh repair of hernia surgery. To determine the ideal anatomical location of mesh repair in hernia surgery with respect to overall complications

Methods: Data of 192 patients with hernia admitted between April 2022 and June 2023 was collected from 10 different hospitals. The patients were equally randomized and subjected to mesh repair with different mesh location.

Result: Sublay – Retromuscular mesh location showed the lowest risk of Infection, Recurrence, Seroma/Hematoma and Overall complications. Inlay mesh location showed the highest risk of Infection, Recurrence, Seroma/Hematoma and Overall complications.

Conclusion: Sublay – Retromuscular mesh location is the most recommended approach due to the lowest risk of Infection, Recurrence, Seroma/Hematoma and Overall complications. Inlay mesh location is the least recommended approach due to the highest risk of Infection, Recurrence, Seroma/Hematoma and Overall complications.

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Introduction

Hernia repair is carried out on many people every year. Most of these surgeries involve mesh implants. These implants sometimes cause serious complications that require mesh removal or mesh failure. Anatomic location - Placement of the mesh is found to be one of the factors that can reduce the occurrence of major complications i.e. hernia recurrence[1]. The location of the mesh affects the incorporation of mesh with the tissues, the tensile strength of the abdominal wall and the repair and immune reaction between the tissue and the mesh.[2]

The most common anatomic mesh location:

1. **Onlay:** Mesh is placed on the anterior facia so as to overlay the defect – opening caused by hernia. Also known as pre-muscular location of mesh[3,14,15]. It is easy to perform and is mostly used to close both smaller and larger hernia openings. Lot of suturing should be done to secure the mesh around and onto the fascia surface. The risk of seroma formation and infection is high. High risk of recurrence due to high pressure against the mesh is observed.
2. **Inlay or interposition:** Mesh is placed between the edges of the facia where the defect – opening is caused by hernia. It bridges the defect[4,12,13]. It is easy to perform and is mostly used in hernias with small gaps. It uses less mesh. The risk of seroma formation and infection is less with small gaps but is more with large gaps. If used with large gaps the pressure against the mesh may lead to recurrence.
3. **Underlay:** Mesh is placed under the gap or inside the facia. It is also known as inside-out technique. The sutures fix the mesh circumferentially and evenly and closes the gap. Due to the improvement in tension, the pressure is stabilized. Hence risk of recurrence, seroma formation and infection is less.
4. **Sublay which is further classified as:**

a. **Retromuscular:** The mesh is placed anterior to the posterior of rectus sheath and posterior to the rectus muscle. The plane continues below the arcuate line as the plane between the rectus abdominis muscle and the transversalis fascia[4,16]. Now it is known as extended totally extraperitoneal repair. It can be performed by laparoscopic and robotic approach both.[5,17]

b. **Preperitoneal:** The plane of the mesh placement is behind all the abdominal wall muscle in front of the peritoneum. It is mostly performed Robotically as it is technically challenging for Laparoscopic platform.[6,18]

c. **Intraperitoneal:** The mesh is placed behind the abdominal wall muscles which include the parietal peritoneum[7]. When performed in an open fashion, the mesh is secured posteriorly to the posterior rectus sheath and the parietal peritoneum of the anterior abdominal.

Some of the authors [8] summarily refer Sublay – preperitoneal and Sublay – intraperitoneal as underlay mesh location.

The anatomic location of the mesh has affects the incorporation of the mesh with the tissues, the tensile strength of the repair and the abdominal wall, and the immune reaction between the mesh and the tissue. Many studies, reviews, and meta-analysis by single-institution are made on this topic. Clear agreement on the ideal anatomic mesh location is still not obtained. There are various factors that affect the mesh placement:

1. Size and gap of hernia
2. Patient condition
3. Patient's overall medical status
4. Preference of the Surgeon

In the present study various anatomic locations of mesh and their impact on mesh repair of hernia was analyzed.

Method:

Data of 192 patients with hernia admitted between april 2022 and june2023 was collected from 07 different hospitals. The patients were randomized and subjected to mesh repair with different mesh location. Patients with hernia size greater than 4 cm were included. The patients, regardless of age and gender, were included in the study. Approval was obtained from the local ethical committees of all the participating hospitals before the enrolment of the patients. Informed consent from all the patients was obtained. The patients were made medically fit and prepared preoperatively so as to withstand the procedure. The cases were analyzed to determine the ideal anatomic mesh location with respect

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to Infection, Recurrence, Seroma/Hematoma and overall complications.

RESULTS:

The randomized distribution of 192 patients and corresponding number of patients with Infection, Recurrence, Seroma/Hematoma and overall complications were:

Sr. No.	Mesh location	Number of total patients	Patients with Infection	Patients with Recurrence	Patients with Seroma/Hematoma	Patients with Overall complications
1.	Onlay	42	6	6	7	16
2.	Inlay	34	4	8	4	14
3.	Underlay	52	10	6	6	19
4.						
4.	Sublay	64	6	4	7	21
5.	Total	192				

Mesh placed in Sublay- retromuscular plane showed lower risk of infection at surgical site as compared to the mesh placed at other locations.

Mesh placed in Sublay- retromuscular, Sublay - intraperitoneal and Sublay - preperitoneal plane exhibits the lowest to higher recurrence rate. The highest recurrence rate is seen with Inlay mesh placement.

Mesh placed in Sublay- retromuscular plane showed lower risk of Seroma/Hematoma compared to the mesh placed at other locations.

Similar observations were inferred with regards to overall complication rates.

No.	Outcome	Onlay %	Inlay %	Underlay %		Sublay – Retromuscular %
				Preperitoneal	Intraperitoneal	
1	Infection	14.3	11.8	19.2		9.4
2.	Recurrence	14.3	23.5	11.5		6.3
3.	Seroma/Hematoma	16.7	11.8	11.5		10.9
4.	Overall complications	38.1	41.2	36.5		32.8

Conclusion:

Sublay – Retromuscular mesh location is the most recommended approach due to the lowest risk of Infection, Recurrence, Seroma/Hematoma and Overall complications. Inlay mesh location is the least recommended approach due to the highest risk of Infection, Recurrence, Seroma/Hematoma and Overall complications. The results are in conformation with the

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literature[9, 10]. The Onlay mesh location is reported as least technically challenging procedure. But still it is not the location of choice because it shows increased mesh and wound infection complications. In Onlay mesh location, the mesh is in direct contact of the environment during the wound revision. This may result into subsequent wound complications also[11].

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